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Pediatrics and Neonatology (2015) 56, 77–78

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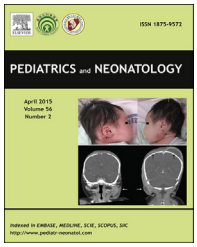

EDITORIAL

The Role of Bilirubin and Phototherapy in the Oxidative/Antioxidant Balance

Bilirubin is generally regarded as a compound which is toxic to the central nervous system, and oxidative stress is emerging as a relevant event in the mechanism of bilirubin-associated encephalopathy. However, in recent years, studies have demonstrated that bilirubin may also exhibit potent antioxidant properties. This was supported by the notion that serum bilirubin increases in response to initial oxidative stress and its role as an efficient scavenger of reactive oxygen species was well documented. Doğan et al[1] suggested that the relationship between serum total bilirubin and antioxidant/oxidative stress could be expressed by a quadratic correlation curve. Thus, the role of bilirubin in the antioxidant panel and the oxidative stress parameter remained a conflicting issue to be further explored. As for the treatment of severe hyperbilirubinemia, phototherapy is currently the most widely used form of therapy. However, reports have shown that oxidant/antioxidant balance is also disturbed during such practice, as some results indicated an increased oxidative stress index after phototherapy.[2,3] Thus, the role of phototherapy in the oxidant/antioxidant status also remains an important topic to be further discussed.

Many studies that investigated the oxidative/antioxidant status in infants with hyperbilirubinemia were mostly comprised of measurements of plasma total antioxidant capacity, serum total oxidant status, and malondialdehyde (MDA).[1,4] Measurement of novel parameters of oxidative stress such as advanced oxidative protein product (AOPP) and S100B were mostly used to evaluate the severity of intraventricular hemorrhage or severe hypoxic brain injury.[5,6] In this issue of *Pediatrics and Neonatology*, Sarici and colleagues[7] were among the first ones to relate AOPPs and S100B with hyperbilirubinemia and phototherapy. In addition to further clarifying and consolidating the existing knowledge about the role of MDA in severe hyperbilirubinemia, the authors also attempted to investigate the effect of phototherapy on serum MDA level. The results showed a positive correlation between MDA and S100B with elevated serum bilirubin level, suggesting an increased oxidative stress in infants with significant hyperbilirubinemia. However, AOPP did not seem to be associated with serum bilirubin level. One possible explanation might be that, because infants with a critically higher serum bilirubin level (including those with kernicterus) were not included in this study, it is possible that changes in AOPP level might only be significant in cases with early-phase bilirubin encephalopathy. However, the significant decrease in AOPP level after phototherapy suggested that phototherapy per se might have an antioxidant propensity, as it was often argued that the antioxidant effect of phototherapy was the result of a reduced serum bilirubin level.

There are several limitations in this study. First, the population number was too small to make any definite conclusions. Second, although the authors had demonstrated similar characteristics between the study groups (severe hyperbilirubinemia vs. controls), causes for infants' jaundice were not clearly stated, so adjustments for potential confounding factors related to hyperbilirubinemia were not made during statistical calculation. Hence, the accuracy of the statistical results remains questionable. Third, cases with hemolytic anemia, G6PD deficiency, and kernicterus were not included in this study, which might cause discrepancies in the results due to selection bias, since hemolytic anemia and G6PD deficiency are often causes of severe hyperbilirubinemia, and infants with kernicterus might be at greater risk for oxidative stress related to brain damage.

Although several attempts have been made to survey the role of bilirubin in the oxidative/antioxidant balance, currently none has reached a definitive conclusion as to whether bilirubin has an antioxidant capacity or causes oxidative stress leading to encephalopathy. The study of Sarici et al[7] provides additional information regarding the effect of bilirubin and phototherapy in the oxidative/antioxidant balance. Their results are in favor of a positive correlation between hyperbilirubinemia and oxidative stress and provide evidence that recognizes the antioxidant efficacy of intensive phototherapy.

http://dx.doi.org/10.1016/j.pedneo.2015.01.001

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Conflicts of interest

The author declares no conflicts of interest.

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Jan 14, 2015

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